

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. *(currently amended)* A computer implemented method for automatically generating ~~a process animation~~ an animation of a disassembling or assembling process of a product, comprising the steps of:
 - (a) obtaining three-dimensional data of a product consisting of a plurality of parts, wherein said three-dimensional data includes assembly structure information of the product;
 - (b) ~~generating disassembly~~ defining, by user entries, disassembling process definition information for disassembling said product into parts thereof ~~according to a user entry, said disassembling process definition information being separate from said assembly structure information;~~
 - (c) generating a ~~disassembly~~ disassembling process algorithm for ~~the parts of said product~~ generating the animation according to said ~~disassembly~~ disassembling process definition information, and storing said ~~disassembly~~ disassembling process algorithm in a memory; and
 - (d) generating ~~a the animation of the disassembly~~ disassembling or assembling process animation of the ~~parts of said~~ product according to said ~~disassembly~~ disassembling process algorithm.
2. *(currently amended)* The method of Claim 1, wherein
said ~~disassembly~~ disassembling process definition information ~~is the definition information of dependency relationships among parts and group relationships among groups, and~~ comprises a tree structure consisting of a node ~~nodes~~ and leaves,
wherein the user defines in step (b), said node and leaves, so as to indicate a disassembling or assembling order in an animation with the node, and to allocate the parts to be displayed in the animation of the disassembling or assembling process to said leaves, which are processes and parts, respectively,

wherein each of said nodes comprises a basic process and an intermediate process performed in the basic process, and

wherein each of said leaves consists of a process parts group for grouping a plurality of parts or parts groups, and said parts or parts groups.

3. *(currently amended)* The method of Claim ~~2~~36, wherein

said step (c) generates said ~~disassembly~~ disassembling process algorithm by adding to said ~~disassembly~~ disassembling process definition information, ~~a moving~~ coordinate systems of said basic process and said intermediate ~~processes~~ process, and ~~a moving~~ movement positions of the parts or ~~the assembled~~ parts ~~groups and the process parts group along within~~ said ~~a moving~~ movement coordinate ~~systems~~ system, that are determined based on said ~~disassembly~~ disassembling process definition information.

4. *(cancelled)*

5. *(currently amended)* The method of Claim 3, wherein

in said step (c), for the purpose of generating the disassembling process algorithm a shape of each of the parts is approximated with a circumscribing polygon thereof, and said moving movement position is set such that each polygon is at a minimum distance from each other which is greater than a predetermined ratio.

6. *(currently amended)* The method of Claim ~~2~~3, wherein

said step (d) comprises the steps of:

generating a partial ~~movement~~ animation for ~~each of~~ the parts or the assembled parts ~~groups~~ in each ~~process for each~~ of the basic process and the intermediate process based on the following parameters:

an animation length,

an interpolation system for between a start and an end point, and

a disassembly coefficient for determining a disassembly moving distance; and

generates generating an entire animation by sequentially connecting said each **partial** animation according to said ~~**disassembly**~~ **disassembling process** algorithm.

7. *(currently amended)* The method of Claim 6, wherein
said step (d) further generates ~~**an**~~ **the partial** animation for each of the basic process or the intermediate process by adding camera view point information.

8. *(currently amended)* The method of Claim 6, wherein
said step (d) further comprises the steps of creating a waiting time animation for between said ~~**partial movement**~~ animations or between processes, and inserting said waiting time animation between predetermined ~~**partial movement**~~ animations **or between predetermined processes selected from said movement animations.**

9. *(currently amended)* The method of Claim 6, wherein
said step (d) further comprises the steps of taking a snapshot at start and end times of said movement animation to generate an initialization animation, respectively, and inserting said respective initialization animation at start and end points of said each ~~**partial movement**~~ animation.

10. *(currently amended)* The method of Claim 1 further ~~**comprising**~~ **comprises** the step of:

(e) modifying said ~~**disassembly**~~ **disassembling process** algorithm and said ~~**disassembly**~~ **disassembling process** animation after said **partial** animation or an entire animation is generated.

11. *(currently amended)* The method of Claim 10, wherein
said step (e) modifies the ~~**partial movement**~~ animation ~~**of each process**~~ by modifying a position, a bearing or a scale of each of the parts ~~**or parts groups for each animation created for each of the basic process, the intermediate process and the processes connecting the basic and intermediate processes, wherein the**~~

~~basic, intermediate and connecting processes constitute the disassembly definition information.~~

12. *(currently amended)* The method of Claim 11, wherein
said step (e) generates and presents a user interface for modifying the position, bearing or scale for each of said parts or ~~parts groups~~ assembled parts.
13. *(currently amended)* The method of Claim 11, wherein
when said step (e) modifies one animation, step (e) also modifies animations of other processes, that are performed within the process corresponding to said one animation, by modifying a position, a bearing or a scale of each of the parts or assembled parts groups in each of those other processes based on said ~~disassembly~~ disassembling process algorithm.
14. *(original)* The method of Claim 11, wherein
said step (e) further permits modification of camera view point information for each animation to modify each animation.
15. *(currently amended)* The method of Claim 11, wherein
said step (e) modifies each partial movement animation in each process by determining an interference among said parts ~~or parts groups~~ during movements thereof for each partial animation ~~created for each of the basic processes, intermediate processes, and the processes that connect the basic and intermediate processes, wherein the basic, intermediate and connecting processes constitute said disassembly definition information;~~ and modifying the position, bearing or scale for each of the parts ~~or parts groups~~ in each animation.
16. *(currently amended)* The method of Claim 15, wherein
said interference among said parts ~~or parts groups~~ during the movements thereof is determined by calculating the interference among respective polygons circumscribed around each of said parts or parts groups.

17. *(currently amended)* A system for automatically generating ~~a process animation~~ an animation of a disassembling or assembling process of a product, comprising:

- (a) a three-dimensional graphic data obtaining unit for obtaining three-dimensional data of a product consisting of a plurality of parts, wherein said three-dimensional data includes assembly structure information of the product;
- (b) a ~~disassembly~~ disassembling process definition information generation unit for ~~generating~~ defining, by user entries, ~~disassembly~~ disassembling process definition information for disassembling said product into parts thereof ~~according to a user entry,~~ said disassembling process definition information being separate from said assembly structure information;
- (c) a ~~disassembly~~ disassembling process algorithm generation unit for generating a ~~disassembly~~ disassembling process algorithm for ~~the parts of said product~~ generating the animation according to said ~~disassembly~~ disassembling process definition information, and storing said ~~disassembly~~ disassembling process algorithm in a memory; and
- (d) a ~~disassembly~~ disassembling process animation generation unit for generating ~~a the animation of the~~ disassembly disassembling or assembling process animation of the ~~parts of said~~ product according to said ~~disassembly~~ disassembling process algorithm.

18. *(currently amended)* The system of Claim 17, wherein
said ~~disassembly~~ disassembling process definition information ~~is the definition information of dependency relationships among parts and group relationships among groups, and~~ comprises a tree structure consisting of a node ~~nodes~~ and leaves,

wherein the user defines in step (b), said node and leaves, so as to indicate a disassembling or assembling order in an animation with the node, and to allocate the parts to be displayed in the animation of the disassembling or

assembling process to said leaves, respectively ~~which are processes and parts, respectively,~~

wherein each of said nodes comprises a basic process and an intermediate process performed in the basic process, and

wherein each of said leaves consists of a process parts group for grouping a plurality of parts or parts groups, and said parts or parts groups.

19. *(currently amended)* The system of Claim ~~18~~41, wherein

said ~~disassembly~~ disassembling process algorithm generation unit generates said ~~disassembly~~ disassembling process algorithm by adding to said ~~disassembly~~ disassembling process definition information, ~~a moving-coordinate systems system~~ of said basic process and said intermediate ~~processes~~ process, and ~~a moving movement~~ positions of the parts or ~~the assembled~~ parts ~~groups and the process parts group along within~~ said ~~a moving movement~~ coordinate ~~systems system~~, that are determined based on said ~~disassembly~~ disassembling process definition information.

20. *(cancelled)*

21. *(currently amended)* The system of Claim 19, wherein

said ~~disassembly~~ disassembling process algorithm generation unit approximates a shape of each of the parts or parts groups with a circumscribing polygon thereof for the purpose of generating the disassembling process algorithm, and the ~~moving movement~~ position is set such that each polygon is at a minimum distance from each other which is greater than a predetermined ratio.

22. *(currently amended)* The system of Claim ~~18~~19, wherein

said ~~disassembly~~ disassembling process animation generation unit generates a partial movement animation for ~~each of~~ the parts or the assembled parts ~~parts groups~~ in each ~~process for each~~ of the basic process and the intermediate process based on the following parameters:

an animation length,
an interpolation system for between a start and an end point, and
a disassembly coefficient for determining a disassembly moving distance; and
generates an entire animation by sequentially connecting said each partial animation
according to said ~~disassembly~~ disassembling process algorithm.

23. *(currently amended)* The system of Claim 22, wherein
said ~~disassembly~~ disassembling process animation generation unit further
generates ~~an a~~ a partial animation for each of the basic process or the intermediate
process by adding camera view point information.

24. *(currently amended)* The system of Claim 22, wherein
said ~~disassembly~~ disassembling process animation generation unit further
comprises the steps of creating a waiting time animation for between said partial
~~movement~~ animations or between processes, and inserting said waiting time
animation between predetermined partial ~~movement~~ animations or between
predetermined processes ~~selected from said movement animations~~.

25. *(currently amended)* The system of Claim 22, wherein
said ~~disassembly~~ disassembling process animation generation unit further
comprises the step of taking a snapshot at start and end times of said movement
animation to generate an initialization animation, respectively, and inserting said
respective initialization animation at start and end points of said each partial
~~movement~~ animation.

26. *(currently amended)* The system of Claim 17, further comprising:
(e) modifying said ~~disassembly~~ disassembling process algorithm and said
~~disassembly~~ disassembling process animation after said partial animation or
an entire animation is generated.

27. *(currently amended)* The system of Claim 26, wherein

said animation modification unit modifies the partial movement animation of ~~each process~~ by modifying a position, a bearing or a scale of each of the parts ~~or parts groups for each animation created for each of the basic process, the intermediate process and the processes connecting the basic and intermediate processes, wherein the basic, intermediate and connecting processes constitute the disassembly definition information.~~

28. *(currently amended)* The system of Claim 27, wherein

said animation modification unit generates and presents a user interface for modifying the position, bearing or scale for each of said parts or ~~parts groups~~ assembled parts.

29. *(currently amended)* The system of Claim 27, wherein

when said animation modification unit modifies one animation, said animation modification unit also modifies animations of other processes, that are performed within the process corresponding to said one animation, by modifying a position, a bearing or a scale of each of the parts ~~or parts groups~~ in each of those other processes based on said ~~disassembly~~ disassembling process algorithm.

30. *(original)* The system of Claim 27, wherein

said animation modification unit further permits modification of camera view point information for each animation to modify each animation.

31. *(currently amended)* The system of Claim 27, wherein

said animation modification unit modifies each partial ~~movement~~ animation in each process by determining an interference among said parts ~~or parts groups~~ during movements thereof for each partial animation ~~created for each of the basic processes, intermediate processes, and the processes that connect the basic and intermediate processes, wherein the basic, intermediate and connecting processes constitute said disassembly definition information;~~ and modifying the position, bearing or scale for each of the parts ~~or parts groups~~ in each animation.

32. *(currently amended)* The system of Claim 31, wherein
said interference among said parts ~~or parts groups~~ during the movements
thereof is determined by calculating the interference among respective polygons
circumscribed around each of said parts or parts groups.
33. *(new)* The method of Claim 2, wherein said parts that are allocated in step (b)
comprise parts or parts groups contained in said assembly structure information, or
process parts-groups which are defined by the user.
34. *(new)* The method of Claim 2, wherein a user defines in step (b), a movement
direction for each of said parts within said nodes.
35. *(new)* The method of Claim 2, wherein a user defines in step (b), displaying or non-
displaying of parts during the animation.
36. *(new)* The method of Claim 2, wherein said node comprises a basic process and
optionally an intermediate process performed in the basic process, and assembled
parts consisting of the parts that are to be disassembled or assembled in the
intermediate process move integrally in the animation of the disassembling or
assembling process.
37. *(new)* The method of Claim 1 wherein step (b) provides a user interface on a
computer for defining the disassembling process definition information.
38. *(new)* The method of Claim 18, wherein said parts that are allocated in step (b)
include parts, parts groups contained in said assembly structure information, and
process parts-groups.
39. *(new)* The method of Claim 18, wherein a user defines a movement direction for
each of said nodes in step (b).

40. *(new)* The method of Claim 18, wherein a user defines displaying or non-displaying of elements in the animation of each of said nodes in step (b).
41. *(new)* The method of Claim 18, wherein said node comprises a basic process and optionally an intermediate process performed in the basic process, and assembled parts consisting of the parts that are to be disassembled or assembled in the intermediate process move integrally in the animation of the disassembling or assembling process
42. *(new)* The method of Claim 17 wherein step (b) provides a user interface on a computer for defining the disassembling process definition information.